Teaching an Experiential and Technical Course via Distance Delivery

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Abstract

This paper describes the experience of delivering a course on Operating Systems in a distance education environment. A number of tools are described which allowed the students to engage in the teaching and practical, hands-on experiential learning that they would have received had they been able to attend an on-site class.

The students reported satisfaction with the course. Many have continued with a subsequent course on PC Hardware which is being offered based on the lessons learnt from this initial offering.

Keywords: online learning, distance education, multimedia tools, CompTIA A+, Operating Systems

1 Introduction

During the second quarter of 2005 a group of students from a rural ICT cluster visited Otago Polytechnic**.** A number of teachers accompanying the students expressed interest in undertaking a course themselves. The request was for a technically focused course which would meet their Professional Development requirements. They felt that they had received more than enough development in the area of pedagogy and the use of computers in the classroom; however they felt that their competency with the technology could be improved.

There were a number of possible courses that suited the request of the teachers. However all courses were designed for a traditional classroom delivery and we had little experience delivering distance course. One of the main features of ICT courses at Otago Polytechnic is the practical hands-on nature of the delivery, a feature common among ITP's. While wanting to meet the request of the teachers we were intent that the courses would retain the experiential and practical content which is supported by theoretical teaching; rather than offer a course which was primarily theoretical and hypothetical.

Further discussion with the teacher identified that courses from the Computer Technician's Certificate would be ideal. Central to this certificate are two courses which teach the material assessed by the CompTIA A+ exams. The topics taught in these courses are commonly taught in NZ ITP's. Many use text and assessments authored by Cisco as part of the Cisco Network Academy Program (CNAP) which teaches both PC hardware and Operating Systems as one integrated course. We have not taken this approach, believing that students benefit from focusing on each field separately.

The teachers indicated that they would find the Operating Systems course valuable as classroom problems tended to be related to configuration issues rather than hardware. Over time, we began to understand how a practical and experiential course could be delivered outside of the typical classroom environment with which we were familiar.

2 Methodology of Course Delivery

2.1 General Design

The delivery of the Operating Systems course had been designed to include traditional classroom teaching, discussion, practical lab work, formative tests, assignments and a final exam. Our challenge was to take all of the elements that we believe foster learning in the classroom and deliver them in a distance environment. The staff involved in teaching the Operating System course were experienced in using online teaching tools, but until this occurrence, had only used them to support on-site classes (Bremer & Bryant 2005).

We received advice that distance students found a great deal of benefit from attending an initial workshop (Baldwin 2005). The purpose of the workshop was overtly to introduce the course material but in reality was primarily social. Our advisors believed that students felt more attached to a course, and less isolated, when they had met their instructors and their fellow students in a face to face environment. The literature on distance education supports this (Nash 2005). During the workshop students would receive initial teaching and be introduced to the software we would use in the course and with the Blackboard, the learning management system which would support the course.

Following the workshop the students would receive weekly updates and tasks to perform. A typical week would involve:

- Reading a chapter of a textbook,

- Watching a presentation delivered on CD-Rom,

- Performing tasks that were assigned,

- Completing a chapter test on Blackboard.

3 Tools Used

The development of an online or distance course requires consideration of the tools that will be used in the delivery of the content (Sturgess 2001). The content for this course was already well established, but we were quite unfamiliar with tools targeting remote students.

3.1 Online Tests: Instructor Resources from Textbook

An easily overlooked, but central tool is the textbook. The course content was heavily structured around this. We have adopted "A+ Guide to Software: Managing, Maintaining, and Troubleshooting" (Andrews 2005) for the Operating Systems course. The selection of text required a well written book with a complete coverage of the content. Many such books exist covering the A+ material. This particular book was selected for the added value material provided to the instructor by the publisher.

Amongst the instructor resources is a large test-bank that is able to be imported into Blackboard. These tests required editing and selection to improve the quality of assessment. After some filtering they provide an excellent formative assessment resource with minimal effort, which is extremely valuable (Peat, Frankline & Lewis 2001). As is common in online courses (Young, & McSporran 2004,), we asked the students to complete a test for each chapter of the book, which meant about one a week. The students could retake the test.

3.2 Presentation: Microsoft Producer

It can be challenging to provide clear and understandable lecture material in a distance learning environment. Video can help achieve this (French 2005). The classroom teaching was captured using the free *Microsoft Producer* which integrates with PowerPoint to capture a video of the lecturer and PowerPoint presentation.

Each week the students received a presentation showing a discussion of the current topic. The aim is to provide numerous formats and perspectives to accommodate the various learning styles amongst the students. An instructor commentary is one attempt at this.

The output from Producer ranges significantly in file size. This is dependant on the sound and video quality that is selected. Various options offer optimisation for downloading from a 56k modem through to streaming at 800kbps from a local CD.

A substantial number of students were in rural areas with unreliable dial-up internet connections. This type of connection is unsuitable for streaming video (McCrohon, Lo, Dang, Johnston 2001). Instead, we used NZ Post as the data transfer medium allowing the students to receive 600-700Mb of data, and occasionally 3Gb. Networking classes commonly joke about the 'bandwidth of a station wagon' example famously used by Tanenbaum (1996). However the concept is very real. Even in today's broadband world it is often worth considering whether a non-networked solution, such as post, is the best option for transporting data.

3.3 Demonstration Video: TechSmith Camtasia Studio

Occasionally we would demonstrate the performance of a task or activity. Normally this is done in class with a data projector and computer. To replicate this activity with the distance class we used Camtasia Studio developed by TechSmith. This software recorded screen activity along with audio commentary.

The file size is again dependant on the output quality that is selected. We normally had ample space on the students weekly CD, so we usually opted for the best quality possible. Usually this resulted in a file size of around 30Mb for a ten minute demonstration; however most videos were significantly shorter.

3.4 Remote Assistance

Access to timely assistance is vital to maintaining student motivation (Misko, Choi, Hong & Lee 2005). Another tool that was used on occasion was Microsoft Remote Assistance. This is a tool that comes with Windows XP which is built on Terminal Services for Windows. It allowed the lecturer to remotely access, and control if necessary, a students PC. This was only possible after negotiation with our IT department as this feature was normally disabled from corporate PC's.

We did not use Remote Assistance often. But it was extremely useful at those times. Other products exist, VNC for example. Remote Assistance has the advantage that it is already installed on any PC with Windows XP. It is not a solution for any student using a Mac, Linux or a Microsoft Operating System prior to XP.

3.5 Practical Activities: Microsoft Virtual-PC

From the outset, one of our main concerns was whether we could provide the students with a rich learning environment that included practical activities. In our normal classes we ask students to routinely format PC's and install a new Operating System. This was possible in our labs which were installed with removable hard drives. These allowed one class to destroy a PC's operating system without affecting other classes (Bremer 2004). Some students did have access to PC's that they could set aside for coursework but many did not.

Our solution was to provide each student with a copy of Virtual-PC. This software emulates the hardware of a PC and allows the user to install various Operating Systems. In full-screen mode it is almost impossible to tell that the environment is emulated. The crucial restriction is the memory requirement. To run virtual-pc you need the minimum RAM required for the host operating system plus an additional amount of RAM for the virtual environment. In practice we have found that 512M is

required to reliably run a single virtual Operating System using windows XP.

Central to our use of this software and the provision of the cd's to students, was our MSDNAA licence with Microsoft. The MSDN Academic Alliance subscription includes the ability to provide students with copies of almost all Microsoft Operating Systems. We were unsure whether this would extend to providing pre-installed Virtual-PC's to students. Microsoft N.Z assured us that this was quite appropriate.

All students either had access to a dedicated PC for the course or were able run Virtual PC. This meant that we were able to give the students the same practical activities that they would undertake in class. The only difference was that the students were on their own for the activities, without an instructor able to prompt and assist immediately if they fell into difficulty.

4   Student Feedback

4.1   Formative Mid-Semester Survey

We were anxious to discover the student perception of the course and to identify any ways in which the course could be improved. During the mid-semester break students were asked to complete an anonymous survey on Blackboard.

The survey was completed by 13 of the 24 enrolled students. In general the feedback was extremely positive and quite flattering (which was not the point of conducting the survey). All thought that the course was well organised and that the supplied resources were sufficient to meet the course objectives. All thought that the presentations were useful. This is consistent with Goodwin & William's (2004) study.

Typical comments were:

- it's a lot of hard work. Certainly I learn a big deal through experiencing failures.

- [the virtual-pc activities] help cement the learning by putting in to practice the theory, helps in remembering some things as well.

- Tasks are great for understanding if they work. A lot of time can be spent trying to figure out why something isn't doing what it's supposed to. I guess I should ask for help.

- I think the course overall is great, I personally don't see changes that need to be made, keep it as is.

As a result of the survey we increased the number of video demonstrations being supplied each week. Several people commented that the initial workshop was worthwhile.

4.2   Post Course Survey

Following the completion of the course, a survey was posted to all 24 students who had enrolled. Only 15 had completed the course, a completion rate of 62%. A higher completion rate would be desirable. However it is widely reported that distance courses typically experience attrition anywhere between 19-90% (Carr 2000, Nash 2005).

There were 12 respondents to the survey. Eight respondents had completed the course. It is noted that these numbers are too low to be definitive.

The main reason given by those who did not complete the course was the workload from employment (0.75 of non-completion) with the remaining person citing the course workload as too high.

The general comments regarding the course were enthusiastic and positive with the main negative/constructive comments indicating that the workload was high, and that more use could have been made of the online discussion forums.

4.3   Subsequent Changes

Our initial experience with delivering an online course was driven from a student request rather than by strategy or design. A number of lessons have been learnt from this course which are being applied to a subsequent offering of a course in PC and Printer Hardware. Some examples include:

- We are continuing with presentations created with Microsoft Producer. This worked well.

- We believe that providing the presentation on CD every week provides an on-going reminder to students that they are enrolled on the course. We do not intend to provide all the material in one parcel even though the postage would be saved.

- Multiple workshops are necessary, especially for the final assessment. This semester we are offering four. This is a lot to ask of the students as some people in are travelling four hours to attend the workshops.

- Regular contact is necessary to maintain motivation and personal contact with the students.

5   Conclusion

As this was the first course delivered by distance from our Department, we were concerned that the quality of learning for the students may be less than ideal. Regardless of our insecurity, the students performed well and achieved high grades. We are confident that it was a valuable learning experience. Student feedback has been extremely positive and encouraging. Most of the people who completed the first course have enrolled in the subsequent courses. We believe that this model is providing a much needed professional development opportunity to rural areas which has been previously unavailable.

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